

Registration No:

--	--	--	--	--	--	--	--	--	--

Total number of Printed Pages-2

M.Tech
IMPE201

2nd Semester Regular/Back Examination - 2015-16

DECISION MODELING-II

Q Code : W894

Maximum Marks - 70

Time - 3 Hours

Answer Question No: 1 which is compulsory and any five from the rest.

The figures in the right-hand margin indicate marks.

- 109
1. Answer the following questions: (2x10)
- (a) What is the difference between state probability and transition probability?
 - (b) Draw the transition diagram of the Poisson Process.
 - (c) What are Karush-Kuhn-Tucker(KKT) conditions?
 - (d) What is little's formula and what is its use?
 - (e) What is the use of Lagrange Multipliers?
 - (f) For the following Convex quadratic Programming Problem:
Minimize : $f(x) = -6x_1 + 2x_1^2 - 2x_1x_2 + 2x_2^2$
S.t : $-x_1 - x_2 \geq -2$, $x_1, x_2 \geq 0$
What is the equivalent complementary problem?
 - (g) Write the Hessian matrix of the function
 $f(x_1, x_2, x_3) = 3x_1^2 + 2x_2^2 + x_3^2 - 2x_1x_2 - 2x_1x_3 + 2x_2x_3 - 6x_1 - 4x_2 - 2x_3$
 - (h) Differentiate between forward recursion and backward recursion.
 - (i) What is a Knapsack Problem? Give some examples of Knapsack Problems.
 - (j) What is a random number generator?
- 109
2. The performance of employees of an organization is rated every year as A, B or C. (10)
Those whose performance rating is 'A', 95% continue in the same category next year, 4% move to "B" category, and the remainder move to the "C" category. For those whose performance is rated as "B", 6% move to "A", 90% stay the same, and 4% move to "C". As for those whose performance rating is "C", only 10% improve to "B" category and rest remain in the same category.
- (a) Express the problem as a Markov chain.
 - (b) In the long run, what would be the percentages of employees having "A", "B" and "C" Performance rating?
- 109
3. Arrival rate of telephone calls at a telephone booth is according to Poisson distribution, with an average time of 9 minutes between two consecutive arrivals. The length of a telephone call is assumed to be exponentially distributed with mean 3 minutes. (10)
- (a) Determine the probability that a person arriving at the booth will have to wait.
 - (b) Find the average queue length that forms from time to time.
 - (c) What is the probability that an arrival will have to wait for more than 10 mins before the phone is free?
- 109

4. Solve the following constrained optimization problem using the classical Lagrangian Technique. (10)

$$\text{Minimize : } f(x) = x_1^2 + x_2^2 - 4x_1 + 2x_2 + 5$$

$$\text{Subject to : } g(x) = x_1 + x_2 = 4$$

5. Solve the following quadratic Programming Problem: (10)

$$\text{Minimize : } f(x) = 2x_2^2 + 3x_1^2 + 3x_1x_2 - 25 (x_1+x_2)$$

$$\text{Subject to : } 2x_1 + x_2 \leq 5$$

$$x_1, x_2 \geq 0$$

6. (a) Determine the values of u_1 , u_2 and u_3 so as to (10)

$$\text{Maximize : } u_1u_2u_3$$

$$\text{Subject to : } u_1 + u_2 + u_3 = 10$$

$$\text{and } u_1, u_2, u_3 \geq 0$$

7. (a) State the principle of optimality for multi-stage dynamic programming. (4)

- (b) A 4-ton vessel can be loaded with one or more of three items. The following table gives the unit weight, w_i in tons and the unit revenue in lakhs of rupees, r_i for item i . (6)

Item i	w_i	r_i
1	2	16
2	3	24
3	1	07

How should the vessel be loaded to maximize the total revenue?

8. (a) Explain a method for generating random numbers. (5)

- (b) Illustrate the application of simulation with a suitable example. (5)